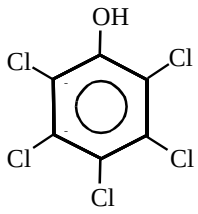
PENTACHLOROPHENOL

Pentachlorophenol is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 87-86-5

Molecular Formula: C_6HCl_5O



Pentachlorophenol is composed of dark colored flakes and sublimed needle crystals. It has a phenolic odor which is pungent when hot. It is soluble in ether, benzene, and alcohol, slightly soluble in cold petroleum ether, and insoluble in water. When heated to decomposition, pentachlorophenol emits highly toxic fumes of chlorides (Sax, 1989). It is also incompatible with strong oxidizers (Sittig, 1985).

Physical Properties of Pentachlorophenol

Synonyms: PCP; penchlorol

Molecular Weight:	266.32
Boiling Point:	310.0 °C
Melting Point:	191.0 °C
Vapor Density:	9.20 (air = 1)
Density/Specific Gravity:	1.978 at 22 °C (water = 1)
Vapor Pressure:	1.1 x 10^{-4} mm Hg at 25 °C
Log Octanol/Water Partition Coefficient:	5.12
Conversion Factor:	1 ppm = 10.9 mg/m^3

(HSDB, 1991; Merck, 1989)

SOURCES AND EMISSIONS

A. Sources

Pentachlorophenol is used as a wood preservative for utility poles, cross arms, and fenceposts. It is also used in the manufacture of sodium pentachlorophenoate (Howard, 1990). Pentachlorophenol (PCP) is registered as a fungicide and insecticide in California. It is applied to seasoned and unseasoned lumber for wood protection (DPR, 1996).

The licensing and regulation of pesticides for sale and use in California are the responsibility of the Department of Pesticide Regulation (DPR). Information presented in this fact sheet regarding the permitted pesticidal uses of pentachlorophenol has been collected from pesticide labels

registered for use in California and from DPR's pesticide databases. This information reflects pesticide use and permitted uses in California as of October 15, 1996. For further information regarding the pesticidal uses of this compound, please contact the Pesticide Registration Branch of DPR (DPR, 1996).

The primary sources of pentachlorophenol emissions in California reported in the United States Environmental Protection Agency's (U.S. EPA) 1995 Toxics Release Inventory (TRI) Public Data Release Report were the lumber and wood products industries (U.S. EPA, 1996b).

B. Emissions

In California, approximately 10 pounds of pentachlorophenol emissions were reported in the U.S. EPA 1995 TRI Public Data Release Report (U.S. EPA, 1996b).

C. Natural Occurrence

It has been suggested that pentachlorophenol may be a product of fungus metabolism (HSDB, 1993).

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of pentachlorophenol. However, the U.S. EPA has compiled ambient air data from Columbia, South Carolina during 1989. A mean concentration of 0.92 nanograms per cubic meter (ng/m^3) or 8.44×10^{-5} parts per billion was reported (U.S. EPA, 1993a).

INDOOR SOURCES AND CONCENTRATIONS

Data on indoor concentrations of pentachlorophenol in the United States are minimal. During June of 1990, 125 households in Woodland, California were monitored for a variety of toxic air contaminants (Sheldon et al, 1992). Pentachlorophenol samples were collected in 88 of the homes; however, only 11 percent of the samples had measurable levels of pentachlorophenol (the quantifiable limit was 0.7 ng/m^3). All measurable samples contained less than 5 ng/m^3. Results from this study indicate indoor levels of pentachlorophenol are generally quite low.

Indoor use of pentachlorophenol has been banned by the U.S. EPA (Hodgson and Wooley, 1991).

ATMOSPHERIC PERSISTENCE

Pentachlorophenol has been detected in particulate matter in air. Particle-associated pentachlorophenol will be subject to dry and wet deposition (of the particles). The average half-life and lifetime for particles in the atmosphere is estimated to be about 3.5 to 10 days and 5 to 15 days, respectively (Atkinson, 1995; Balkanski et al., 1993). The dominant atmospheric

loss process for gaseous pentachlorophenol is expected to be by photolysis and reaction with the hydroxyl radical. No information is, however, available concerning the rates for these processes in the atmosphere (Atkinson, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

Since no emissions of pentachlorophenol from stationary sources in California have been reported under the AB 2588 program, it was not listed in any of the risk assessments reviewed by the Office of Environmental Health Hazard Assessment.

HEALTH EFFECTS

Probable routes of human exposure to pentachlorophenol are inhalation, ingestion, and dermal contact.

Non-Cancer: Pentachlorophenol is a potent metabolic poison that uncouples oxidative phosphorylation. It is irritating to the eyes and respiratory tract. Acute inhalation exposure to pentachlorophenol in humans may result in effects on the circulatory system including heart failure, as well as effects on the liver. Chronic inhalation exposure in humans has resulted in inflammation of the upper respiratory tract and bronchitis, blood effects such as aplastic anemia, and effects on the kidney and liver (U.S. EPA, 1994a). Chemical acne has been associated with prolonged exposure to this compound (Sittig, 1991).

The U.S. EPA has the Reference Concentration (RfC) under review, and has established an oral Reference Dose (RfD) of 0.03 milligrams per kilogram per day based on liver and kidney pathology in rats. The U.S. EPA estimates that consumption of this dose or less, over a lifetime, would not likely result in the occurrence of chronic, non-cancer effects.

One study in humans found adverse reproductive function associated with elevated levels of pentachlorophenol and/or lindane in the blood. The presence of lindane, and other confounding factors, prevented assumption of a direct causal relationship to pentachlorophenol exposure. Data from animal studies indicate exposure to pentachlorophenol may decrease survival in offspring of rats, and produce depressed maternal body weight, but does not cause birth defects (U.S. EPA, 1994a).

Cancer: An association between pentachlorophenol inhalation exposure and cancer has not been established from available epidemiological studies. However, these studies are considered inadequate due to possible observation bias of the study participants and other factors. Mice, exposed orally to pentachlorophenol, have been observed to have increased liver tumors and two uncommon tumors (adrenal medulla pheochromocytomas and hemangiomas) (U.S. EPA, 1994a).

The U.S. EPA has classified pentachlorophenol in Group B2: Probable human carcinogen, and has calculated an oral unit risk estimate of 3×10^{-6} (microgram per liter)$^{-1}$. This means that if an individual were to ingest water containing pentachlorophenol at 0.3 micrograms per liter over

an entire lifetime, that person would theoretically have no more than a 1 in 1 million increased chance of developing cancer (U.S. EPA, 1994a). The International Agency for Research on Cancer has classified pentachlorophenol in Group 2B: Possible human carcinogen (IARC, 1991a).

The State of California has determined under Proposition 65 that pentachlorophenol is a carcinogen (CCR, 1996). The inhalation potency factor that has been used as a basis for regulatory action in California is 5.1×10^{-6} (microgram per cubic meter)$^{-1}$ (OEHHA, 1994). In other words, the potential excess cancer risk for a person exposed over a lifetime to 1 microgram per cubic meter of pentachlorophenol is estimated to be no greater than 5.1 in 1 million. The oral potency factor that has been used as a basis for regulatory action in California is 1.8×10^{-2} (milligram per kilogram per day)$^{-1}$ (OEHHA, 1994).